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Development and Calibration of a Digital Recording System for Automation of Runoff Measurement

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Abstract

The measurement of surface water flow (runoff) by the use of ICL7106 Digital converter is a new concept of runoff measurement in the developing countries. It is a very efficient, low power analog to digital (A/D) converter. The necessary active devices used for the development of the digital recording system include decoders, display driver, reference resistor, a clock, sensor, liquid crystal display (LCD) and ICL7106. The ICL7106 is designed to interface with a liquid crystal display (LCD), which includes a back plane drive. A runoff collector of area 1m^2 and depth 30 cm was constructed, and a discharge pipe, 2.5 cm diameter and 60 cm length conveys the runoff into a storage tank, 30 cm \times 30 cm \times 30 cm in dimension. Both the runoff collector and the storage tank were made of metal sheet (gauge 12). This equipment was designed to measure the amount of runoff that flow into the runoff storage tank through the discharge pipe, such that the resistor sensed runoff according to the level of water in the tank. The sensor divides the reference voltage V_r in ratio to the value of resistance (R). This varying voltage is now converted to digital readout by A/D converter with respect to liquid crystal display (LCD). The device was calibrated using the measuring cylinder and a high correlation coefficient was obtained between the records of the digital sensor and the water depth measured with the use of measuring cylinder ($R^2 = 0.89$). The relationship between the sensor value and the water depth was of the form $y = 2504.2x - 17693$. This research development is useful in weather forecasting, flood and hydrological analysis in natural science studies.

Keywords: Analog, digital, runoff, sensor, water depth